Space Weather Forecast

Issued on Monday, 17 July 2023 at 01:26 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate R1/R2 Blackouts likely throughout G1-G2/Moderate likely Storms Day 1 (17 July), and possible Day 2 (18 Jul).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate, with three Moderate flares observed, the largest from the large sunspot in the southwest, which is a large and mature region, but has decreased slightly in areal extent as it approaches the southwest limb. The other large region on the disc was the source of the other Moderate flares. This is a large open region in the northeast quadrant, with a simple and symmetric leader spot, but a more complex trailing spot. A further moderate moderately sized region in the northeast has also seen ongoing growth in its intermediate spots. There are currently eight sunspot regions on the visible disc.

Several CMEs (Coronal Mass Ejections) were observed leaving the Sun over the past 24 hours, however none of them are currently considered Earth-directed. The largest and fastest CMEs originated from a region located well beyond the western horizon. Further CMEs from the large region in the southwest have been analysed as not being Earth-directed.

Solar Wind / Geomagnetic Activity: The solar wind showed the arrival of a CME from a yet to be determined source. The solar wind rose sharply from background, near 350 km/s to around 440-500 km/s at 17/1837 UTC. The total magnetic field was initially weak but jumped sharply at 17/1837 UTC to persist around Moderate. The north-south component become moderately southward at this time, before gradually rotating to be weakly positive at the end of the period. Geomagnetic activity was Quiet (Kp 0-1) at first, but rose to be Unsettled to Active (Kp 3-4) from 16/1800 UTC.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) rose above the S1 Minor Solar radiation Storm threshold between 16/0630-0910 UTC, reaching a peak of 18pfu at 16/0735 UTC, before slowly coming back down during the following hours.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is likely, with a slight chance of Strong flares.

Solar Wind / Geomagnetic Activity: Current CME influence is expected to gradually ease early on day 1 (17 Jul). A further CME is then likely to arrive on day 1 (17 Jul) from the 14 Jul. The strength of any impact is low confidence, due to uncertainties about the material content of any CME, along with limited imagery for analysis, however this is currently expected to arrive 17/1400 +/- 10 hours with effects continuing into day 2 (18 Jul). There is a slight chance of a small enhancement from the fast winds due to a coronal hole later day 3 (19 Jul), but otherwise solar winds are likely to ease towards background. Unsettled to Active geomagnetic activity is likely at first, with a chance of G1 Minor storms, easing for a time day 1 (17 Jul) before the arrival of the CME later in the day. G1-G2 Minor to Moderate storms then likely. Ongoing CME effects are expected into day 2, before gradually easing back to mainly Quiet with Unsettled spells by day 3 (19 Jul). However any further enhancement from the coronal hole is likely to bring a spell

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of Active conditions, most likely later day 3.

Energetic Particles / Solar Radiation: No solar radiation storms are currently expected, but there is a slight chance of reaching the S1/Minor Storm threshold through the period, should any large X-ray flares occur. An increase in observed count rates may also occur just ahead of the CME arrival expected on day 1 (17 Jul)

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	60	40	5	5
Strong	G3	No	20	10	1	1
Severe	G4	No	2	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	75	70	60	60
Very Active	R3 to R5 X	No	15	15	10	10

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Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	Yes	30	15	10	10
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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